

# SMART

## *Surface-sensing Measurements for Atmospheric Radiative Transfer*



### **Key SMART Facts**

**Heritage:** In response to NASA's need of swift deployment for field studies, a suite of ground-based remote sensing instruments to investigate atmospheric solar and terrestrial radiation was synthesized as a Laboratory of Atmospheres mobile facility.

SMART began with a Micro-Pulse Lidar, a Sun/Sky photometer and five broadband radiometers in 1998, which rapidly grew to over thirty different sensors – covering a spectral range from ultraviolet, visible, near-infrared, shortwave-infrared, longwave-infrared, to microwave. As the suite continues to evolve, all instruments are integrated into a twenty-foot weatherized and thermally controlled trailer to facilitate the shipping to and operation in the field.

SMART has now been an integral part of multiple field campaigns, including the ongoing Asian Monsoon Years (2008-12), NAMMA (2006), BASE-ASIA (2006), UAE<sup>2</sup>(2004), ARM Aerosol-IOP (2003), and CRYSTAL-FACE (2002). Many unique datasets have been generated for ground-

based remote sensing studies in atmospheric sciences.

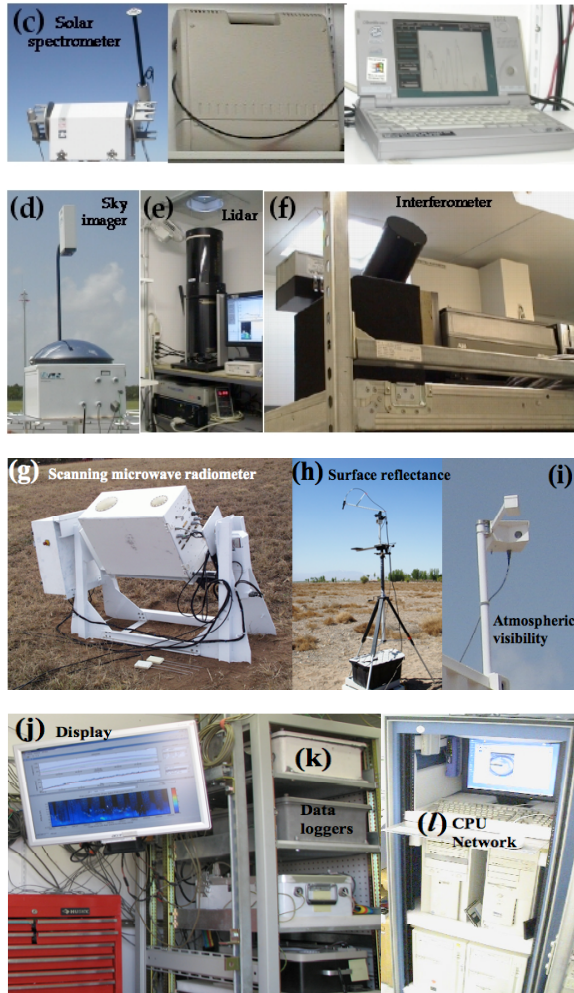
A companion in-situ measurement package was built in 2006 to form the SMART-COMMIT mobile laboratories.

SMART-COMMIT's mission is designed to pursue the following goals:

- Earth Observing System (EOS) validation
- Innovative investigations
- Long-term atmospheric monitoring

**Normal Field Configuration:** Ground-based station with many global, diffuse and direct broadband radiometers (*cf.* Fig. a), sun/sky photometers and a shadow-band radiometer (*cf.* Fig. b), a spectroradiometer (*cf.* Fig. c), a whole sky imager, a micro-pulse lidar, and an interferometer (*cf.* Figs. d/e/f), a scanning microwave radiometer, a surface reflectance spectral radiometer, an optical visibility sensor (*cf.* Figs. g/h/i), a large display, several data loggers and a computer network operating inside the trailer (*cf.* Figs. j/k/l).





### **SMART Data Products**

- Global, diffuse and direct solar irradiance, with various bands of energy partitioning
- Global sky longwave-infrared irradiance
- Transmitted and sky solar spectral radiance and various narrow-band radiance at atmospheric window regions
- Emitted downwelling infrared radiance
- Microwave downwelling sky radiance
- Normalized backscatter intensity
- Total sky imagery
- Atmospheric visibility near the ground
- Surface bi-directional reflectance

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### **References**

**URL** <http://smart-commit.gsfc.nasa.gov/>

### **SMART Parameters**

- Broadband: 0.3~3, 0.4~3, 0.7~3, 4~50  $\mu\text{m}$  (global, diffuse & direct component)
- Narrowband: 302, 308, 315, 336, 377 nm (global); 414, 498, 614, 672, 866, 939 nm (global & diffuse); 340, 380, 440, 500, 670, 870, 870 horizontally polarized, 870

vertically polarized, 940, 1020, 1240,  
1440, 2130 nm (direct)

- Laser frequency: 532 nm
- Shortwave spectra:  $0.35 \sim 2.5 \mu\text{m}$

- Longwave spectra:  $3 \sim 20 \mu\text{m}$
- Microwave: 23, 36 GHz
- Sky image: RGB